TAMDAR Business Case

Paul Kauffmann
Erol Ozan

Business Case Goals

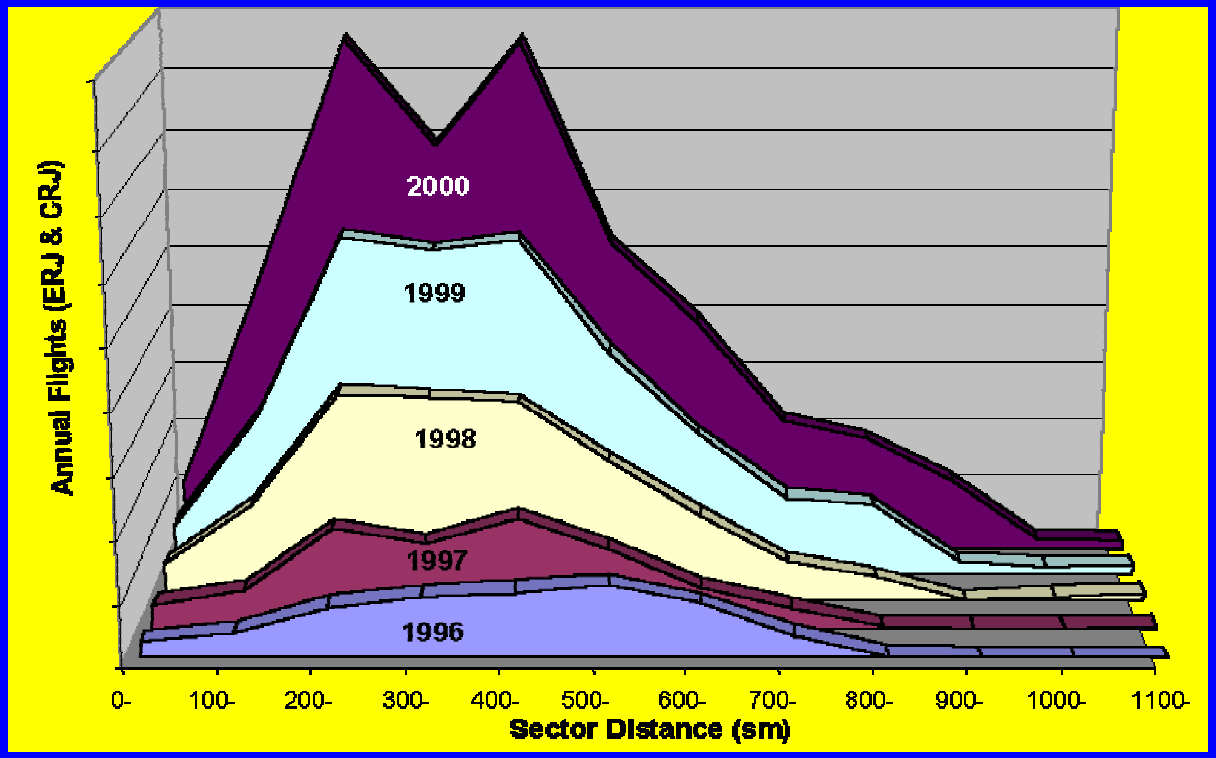
- Identify factors and develop integrated business case
  - Issues related to aircraft systems and technology plans
  - Candidate aviation segments to equip for TAMDAR.
  - Competitive weather data sources
  - Marketability of TAMDAR by for-profit weather information providers.

FIS - Regional / Commuter

- Flight information systems (FIS) present potential to "multi-task" and reduce nonrecurring costs.
  - Several large regional carriers already equipped: Atlantic Coast Airlines, American Eagle, and Continental Express
  - Reviewed business cases: Seen as both a business and strategic need.
  - Expect to be reimbursed for incremental costs
- Conclusion: Strategic requirement for regional / commuter airlines.

Regional Flight Characteristics

RJs: highly utilized , average 7 legs per day.



- A unique opportunity: In next ten years, 1000- 2400 new RJs will enter service.

Increasing number of short flights at lower cruise elevation

Package Carriers

- Desirable characteristics – night routes.
- No major change in fleet equipment anticipated.
- No compelling business need for FIS.
- Expect costs to be reimbursed

	Piston	Turbo prop	Jet
Flights per 24 hr period	3.1	2.4	5.5
% Flights between 11PM and –7AM	39.4	47.2	80
Hours per flight	1.1	1.2	1.5
Cruise elevation (000 ft.)	7.5	13.0	32
Distance (nm)	133.0	229.4	400

What About Business?

- Business aircraft fly to desirable airports

Flights into the following airports	Percent of Flights
Major hub airports	28
Secondary airports served by scheduled airline	34
Airports with infrequent or no scheduled service	39

- BUT…..Low flight hours per year = lower data point bang for investment buck!

Type	Hours per year
Piston	257
Turboprop	407
Light jet	463
Medium jet	438
Heavy jet	466

Summary - GA Analysis

- Owners motivated for weather information
- Low cost threshold for instrument purchase plus data link costs
- BUT……Operational issues
  - Data quality, instrument repair
  - Low monthly flight hours
  - System management and control

Conclusion: Target Participant Segments

- Issue: data point bang for the investment $
- Target: Package and Regional carriers

Success Characteristics	Weight	GA	Business	Package	Regional
Predictable routes	0.2	1	1	9	9
Flight density	0.2	1	3	9	9
Cruise elevation	0.1	9	3	9	3
Professional maintenance / quality	0.3	1	9	3	9
Low non recurring cost	0.2	1	3	1	3
Total Value Score	1.0	1.8	4.4	5.6	7.2

Weather Information Providers and New Products

- TAMDAR has potential to promote development of new products
  - The most promising markets are aviation, military, departments of transportation, and broadcasting.
  - The most commercially valuable weather data identified as turbulence, winds aloft, and icing.

Alternative Sources: NAOS Radiosonde Study

- Studied 14 sites that matched airports with ACARS data and impact of elimination on three forecast models - Global, Eta, and RUC.
  - Finding: elimination of these sites had little practical effect.
  - Cost impact: Reduce annual program costs by $1.2M to $1.8M.
- NOTE: Study did not recommend elimination but said this should be reconsidered when ACARS / MDCRS (TAMDAR) provides moisture.

Business Case: Basic Equation

- TAMDAR system value = -Non recurring investment – Annual recurring costs +Annual NWS savings + Annualized aviation savings
- Next slides discuss these terms

Data Points and Aircraft

- Data points using WMO- AMDAR standards: 240,000 per day
  - 30,000 cruise and 210,000 for soundings
- Estimate required aircraft by allocating points using flight durations and frequencies in target segments:
  - 1500 total: 1000 regional and 500 package

Non Recurring Cost: $14.75M

- Initial investment: sensor / communication link for 1500 aircraft.
- Cost of TAMDAR certification
- Cost of infrastructure / software required to interface with the TAMDAR program.

	Sensor	Data Link	Number of Aircraft	Total
Regional	$5,000 per A/C	$1,250 per A/C	1000	$6,250,000
Package	$5,000 per A/C	$5,000 per A/C	500	$5,000,000
Certification	$1,000,000	$1,000,000		$2,000,000
Infrastructure	$1,500,000 for interface software and server systems			$1,500,000
	Total Estimated Nonrecurring Cost			$14,750,000

Recurring Cost

- Estimated at $2.9M per year including data transmission, processing, maintenance, and infrastructure

Recurring Cost	Package	Regional	Total
Daily data points	32,000	128,000	160,000
Yearly data points	11,680,000	46,720,000	58,400,000
Transmission cost / point	$0.010	$0.010	NA
Processing cost / point	$0.014	$0.014	NA
Annual data point cost	$280,320	$1,121,280	$1,401,600
Equipment maintenance	$500,000	$437,500	$937,500
FSL / NWS infrastructure	$300,000	$300,000	$600,000
Total	$1,080,320	$1,858,780	$2,939,100

TAMDAR Savings / Benefits

- Societal benefits for improved short term forecasts well documented.
  - Transportation, agriculture, public safety, etc.
- For simplicity, focused on delay: 89M minutes
  - OIG delay costs: $4B without passenger delay.
  - ATA: $2B for scheduled delay; $5B with passenger delay (but omitting unscheduled delay).
- Estimated comprehensive weather related delay costs at $4.2B using FAA methodology.

Business Case Summary

Cash flow summary		
Year	**0**	**1-10**
Initial nonrecurring	$14,750,000	
Annual data point cost		$1,401,600
Maintenance		$ 937,500
Infrastructure		$600,000
Radiosonde savings		$ 2,700,000
Delay Savings		$ 4,211,196
Annual cash flow	**$ (14,750,000)**	**$ 3,972,096**
Present Value cash flow @ 7%	**$ 13,148,337**	
IRR=	**24%**	

Many studies substantiate the OOM of 0.1% for delay savings.

Results - Insensitive to Change

Non recurring Investment Decision Reversal

	Base Package	Package Reversal	Base Regional	Regional Reversal
Investment per aircraft	$10,000	$25,477	$6,250	$15,065
Fleet size	500	1,230	1,000	2,273

Sensitivity Summary

	Base Case	Optimistic Radiosonde	No radiosonde
Annualized cost of TAMDAR	$5,039,168	$5,039,168	$5,039,168
Savings			
Radiosonde saving amount	$2,700,000	$3,600,000	$0
Required delay savings for positive business case	$2,339,168	$1,439,168	$5,039,168
Percent of weather related delay required for positive business case	0.056%	0.034%	0.120%
IRR if weather related delay saving is 0.2%	55%	61%	35%

Conclusions

- TAMDAR has a robust business case with high potential to impact forecasting and aviation operations
- It is a cost effective approach to help a problem with few near term alternatives
  - Technology change with regional carriers presents a unique opportunity.